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Original Paper

Comprehensively Structured Teaching Method for an Adult Individual with Autism

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Key words: individual with autism spectrum disorder, TEACCH, structured teaching method, weak central coherence, executive dysfunction

Abstract

In this study, the effectiveness of a comprehensively *structured teaching method* for an adult with autistic spectrum disorder (ASD) (age 37) complicated with severe intellectual disability (ID) who had 'refusal' and 'deviate' behaviors during his tasks at the institution was discussed. The main components in this study were 1) physical structure, 2) structured work, 3) schedule systems, 4) positive behavior support (PBS), and 5) setting support guidance for staff. The number of 'one-day tasks' and 'refusal' and 'deviate' behaviors a day before and after intervention were compared. Prior to the intervention, the number of 'one-day tasks' was 3 to 7. After the intervention, 10 to 27 were observed (*SD*=5.96) and they were increasing. The number of 'refusal' and 'deviate' behaviors was 3 to 5 before intervention, and after it became 7.67 to 2 (*SD*=1.34) and they were decreasing. As a result, we clarified that a comprehensively *structured teaching method* was effective in increasing for an adult individual with ASD those task performances and reducing those inappropriate behaviors. In addition, it is assumed that these approaches to the comprehensively *structured teaching method* could be helpful for *weak central coherence* and *executive dysfunction* well known as ASD's cognitive developmental disorder.

Introduction

Autistic individuals with severe intellectual disability often have behavior problems in the life domain from adolescence to adulthood without enough overview of actions and achievement motivation for working [1]. One of its causes is a lack of a support package including insufficient understanding of autism by the people around them. Understanding about the model of disability on cognitive development of autism is essential in comprehending behavior problems. From this perspective, a "model of disability" described by the World Health Organization (1999) and Kono (2000) enables the comprehensive analysis of the impairment of organic brain neural network failure as medically- and biologically-defined functional and morphological disorder [2-5], the subsequent *weak central coherence* of disability as functional and skill disorder and *executive dysfunction* [6-9], and handicap as a disadvantage / inconvenience in their lives

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induced by having both (see Fig. 1).

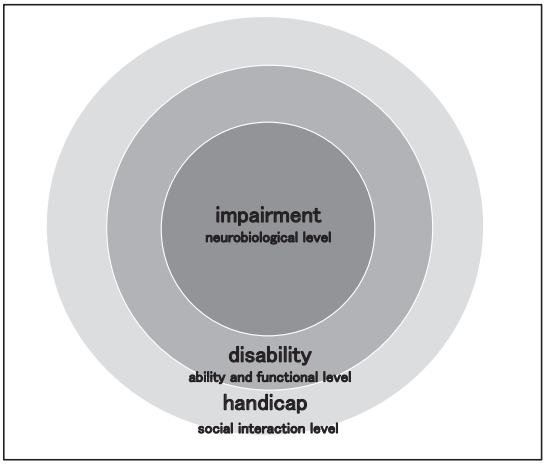

Fig. 1 Classification model of autistic disorder

Although behavior problems of autistic children tend to be regarded as handicaps in their social life, they are essentially cognitive function disabilities. Distinguishing between disabilities and handicaps is the feature of assessment in remedial education support. *Weak central coherence*, the hypothesis of cognitive function disability in autistic children and adults, describes the difficulty in meaningful and consistent organization of the entire information due to focusing on small pieces of information [6]. Another concept *executive function* is the cognitive function to keep proper focus for achieving expected goals and autistic persons are perceived to have *executive dysfunction* which means cognitive function disorder of planning, restraint and conversion [10]. As such studies evaluating cognitive function in autistic individuals have been advanced, a *structured teaching method* presented by *TEACCH* is gradually considered to have a rationale for and to be theorized for approaches for the disorders [11].

In this study, the case targeted support in the vocational domain for an autistic adult with severe intellectual disability and made an assessment to define the following specific objectives and measures of support:

a) Use of "visual representation" according to the assessment
b) Design of "individual environmental setting" [12]
c) Positive Behavior Support (PBS) with a positive reinforcer for shaping of proper behavior [13]
d) Expansion of independent behavior and formulation of appropriate and meaningful routine patterns
e) Through the above approaches, life structuring with "motivation" and having an "overview" in the vocational domain and promoting Quality of Life (QOL) by establishing a "non-disturbed life style"

Methods

1. Participant

Subject A was a male with autism aged 37 years old when the supports started to be provided and lived in the institution B. The Suzuki-Binet test showed the results of MA (2 : 8), CA (17 : 10), and IQ (17) and his rehabilitation certificate grade was A. In every aspect of life, he was dependent on others to a great extent and hardly took actions voluntarily. The way of life activity was assisted with a "prompt" by staff members at the institution mostly in a passive manner. In subject A's remedial teaching history, his family judged that it was difficult to maintain home education and he entered a child welfare facility when he was in upper secondary school, for the physically and mentally disabled. Subject A stayed in the institution

B 365 days a year at the time of intervention. Though he was an adult, the reference Childhood Autism Rating Scale (CARS) was performed and the score was 44.5, which estimated that he had moderate or severe autism [14].

Subject A was able to understand each proposed activity and content of tasks at the daytime work area, however his tolerance was poor and he did not seem to have achievement motivation for the task itself. His body stereotypically swayed, and he frequently walked around in the work area, made strange sounds and injured himself by biting his fingers depending on the situation. When he was left in an excited state, refusal behavior against tasks and disappearances from the work area occasionally occurred. He had been strongly interested in food since childhood and had chronic obesity when he entered the facility. Due to the interest in food, he took food from others from time to time.

2. Setting

Subject A was supported by a work team at the daytime work area of the institution B. Data from a 30-day assistance for intensive support was evaluated and computerized. In the vocational domain, task analysis of informal assessment was performed, change in behavior was observed pre- and post-intervention, and the effect of intervention was estimated. With regard to work volume, a provision of three 10-min tasks was defined as one session. During tasks, the study specified “refusal behavior (as abandonment of task / excitement)” and “deviate behavior (as leaving his seat / disappearance from the work area)” which were regarded as “dependent variables”. Change in the number of work sessions through comprehensive structuring support was defined as an “independent variable”. The intervention education team and recording team were organized and monitored the subject’s behavior to count the variables from the baseline, in intervention phase I implemented physical structuring and task organization as well as a 5-day picture card teaching support, and in intervention phase II performed a 5-day schedule system teaching support for time organization in addition to the same support as in phase I and investigated change in the number of work sessions, refusal and deviant behaviors in the setting of a 3-day intervention fade-out phase.

3. Procedures

Assessment

Under intervention support, 8 steps of behavior were categorized from a representation of sitting at work and doing a series of actions to start working to perform the next activity after finishing the current one and “task analysis (see Table. 1, 2)”. After gathering subject A’s individual characteristics with autism, support methods were summarized according to the characteristics in the “Autism Characteristic Sheet (see Table. 3)”.

Table 1 Task analysis during pre-intervention (session, 1)

Skills	Evaluation*	Comments	Modifications
1. Transferring from a rest area to a work one	P	Knowing well the cue, distinguishing work seat	Trying to introduce schedule system
2. Take a work seat and doing independent tasks	E	Leaving work frequently with unfinished and uneven work	Controlling of stimuli by rezoning of a work area
3. Independent process of tasks	E	Unable to understand some tasks, with intention to finish	Preparing task organization according to his ability
4. Careful working and counting parts of an instrument	F	Lack of consideration concept of number and slipshod handling of parts of instrument	Trying to introduce jig
5. Asking of a nonunderstandable task	F	Leaving an unattainable task by nonunderstanding	Getting errorless learning by task organization
6. Reporting of finished tasks	F	Reporting with difficulty, but only by leaving work area	Letting him put a finished task in a box
7. Transferring from a work area to a rest one	F	Transfer with difficulty	Use of transition system for individual
8. Coming back from a rest area to a work area after a fixed period of time	E	Prompting by staff to come back to a work area	Use of reward system for finishing tasks

*P: pass E: emerge F: failure

Table 2 Task analysis during post intervention (session, 29)

Skills	Evaluation*	Comments	Modifications
1. Transferring from a rest area to a work one	P	Transferring to work area himself by intervention	
2. Take a work seat and doing independent tasks	E	When task is difficult, he is leaving seat	Consider the number of tasks and degree of difficulty
3. Independent process of tasks	E to P	Processes of task are completed	
4. Careful working and counting parts of an instrument	F to P	Passed by use of jig	
5. Asking of a nonunderstandable task	F	Not appear to ask a question and impress	Necessary to communication system for individual
6. Reporting of finished tasks	F to E	Put a finished task in a box	
7. Transferring from a work area to a rest one	F to P	Individual's attention was to the schedule, and understanding finished concept	
8. Coming back from a rest area to a work area after a fixed period of time	E to P	Tansition to schedule from rest time, and come back to work	

*P: pass E: emerge F: failure

Table 3 Characteristic of participant from ASD, and method of intervention

Pre intervention	Method of intervention
1. Degree of physical structure	
No individual's particular work desk and seat, and rest area.	Setting up the work area, seat, and rest area. Making a boundary by a screen.
2. Schedule system	
Individual who understands the schedule observation by surrounding activities.	Instruction of photograph card schedule system.
3. Task contents, the time required and volume of one session	
Not have certain work sessions, and concentration does not continue with the same task.	Provision of three 10-min various tasks was defined as one session.
4. Work system	
Could not follow a work example and regulation, and then wait prompt passively.	Offering of the independent task showing a system of manufacturing on asssenbly line from the left to the right of putting finished tasks in a box.
5. Idea of visual structure and device for tasks	
Lacking in concept of number and quantity, and without much communication ability individual's own initiative.	Making up for individual cognition of a number, quantity, and degree using by a jig. Using visual aids to do tasks independently.
6. Reward system	
Did not seem to have achievement motivation for the task.	Reinforcement schedule was a “fixed ratio schedule” to one session.
7. Notion of finishing	
Capable of finish concept from quantity of independent tasks but unable to understand number of session and daily activity schedules.	Transferring to presentation of activity according to the schedule system of the finishing tasks. After finishing activities .
8. Communication possible for understanding	
Unable to raise articulation and limit to realization of language.	Use of systematic instructions by prompt, and with a little emphasis on some words.
9. Difficult situations and stimuli	
Urging himself to work without concrete indication. Difficulty in emotional control over any foods as a visual drive.	Unification guidelines for staff for the purpose of systematic instruction for individual.

3.1 Physical Structure

Prior to the environmental setting, there were some compartments roughly separated with the spaces often used for both work and rest, meaning that there was no specific workspace only for subject A. Under such an environment, refusal and deviant behaviors on tasks frequently happened without a clearly defined task or workspace. Then, the work area was compartmentalized with "partitions" in order to control visual stimulus, which aimed at helping promote subject A's space cognition by "one to one" confirmation between the task and space as mentioned in "1. Physical Structuring" of Table. 3-1 Individual Information Sheet.

3.2 Work System

Concerning the contents of work, a part of the ordered work (on-the-side job undertaken from a company) was provided focusing on an independent task. Meanwhile, task organization on the independent tasks took place so as to make the expected task achievement visually understandable via an approach for "visual dominance" [15], which is one of autism's characteristics. Ordered work was implemented utilizing a "jig" which advances task achievement. The *TEACCH* method defines such task visual structuring as "task organization". The beginning and end of tasks are concretized in a visual way in constant order, and the next schedule comes up after completing the current work.

The work system was set up where the process of tasks was standardized constantly in the left-to-right fashion, each completed work was put in the finished box, and finishing one session without any more presented work led to the next assigned task.

3.3 Schedule System

It was observed that subject A cognized tasks from his surrounding situation and spent his time on the basis of his own sense of time, which sometimes developed an attitude of self-centeredness, causing a gap with others, and often resulted in disappearance from the area and deviance. However, the assessment suggested the subject's high potential regarding word-level language comprehension and acceptable communication skills on picture cards of tangible objects (see Individual Information Sheet "8. Acceptable Communication"). Hence, subject A's activity flow of the day per action unit was represented, with intervention phase I cards that were passed with the words "first" and "then," and in the intervention phase II schedule system which showed every quarter of the all-day activity plan.

3.4 Positive Behavior Support (PBS)

PBS is an approach of Applied Behavior Analysis to reinforce proper behavior using positive reinforcing stimulus actively. After the completion of a work period, a "token" was given in compensation for it (see Individual Information Sheet "6. Compensation System"). After each work period, the subject took a token card which was posted on the schedule, went to the "token area", and exchanged it for his favorite food, "snacks: a primary reinforcer". At the time, eating snacks meant "positive reinforcing" for subject A which reinforced the previous work.

If subject A understood that the snack card itself can turn into a token or post-work preferable action (snacks or lunch, etc.), it would function as an "activity reinforcer". Snack time was provided after completion of one session of work. Accordingly, the occurrence rate of the reinforcer (reinforcement schedule) was a "fixed ratio schedule" to one session [13].

3.5 Unification Support Guidelines

Subject A was often confused by instructions from multiple staff members of the team and the members also had quite a few discrepancies in support methods among them. Since subject A was not able to visually

perceive the surrounding information to understand the overview or control the stimulus, challenging behaviors such as disappearance often occurred. Therefore, staff members prepared guidelines to teach subject A the overall way to live in the vocational domain before the intervention started, and it was a preventive against different teaching and supporting methods by the members. Overall, staff members who were involved and supported an autistic person are also part of the environment, and therefore supporting members should have common rules for intervention [16]. Constant standards and consistent supports understandable for the subject were followed.

Results

In intervention phases I and II, the mean number of refusal / deviate behaviors during tasks decreased from 7.67/day to 2.0/day (*SD=1.34*), and the mean number of works increased from 4.7/day to 20.0/day (*SD=5.96*) after the intervention. At baseline, the average number of works was approximately 4.7/day as the subject was irregularly prompted to do tasks by staff members according to his condition before the intervention. Reinforcement system teaching and task structuring in intervention phase I increased the average number of works to 7 sessions equal to 20 works in the conversion. Throughout the teaching period of intervention phase I, a variety of restructuring of independent tasks and ordered works were conducted in the education process. In intervention phase II of schedule system education, not only the number of works increased but the scope of the appropriate independent behavior was expanded when the mean number of deviance from the area decreased to 0.3.

Task analysis in the vocational domain which was evaluated at baseline was re-assessed in the fade-out phase and tasks which previously had expressions or failed were improved (see Table. 3). The overall result graph is shown in Fig. 2. The comparison of the number of works as well as the rates of avoidance and deviant behaviors between pre- and post-intervention is illustrated as a graph in Fig. 3.

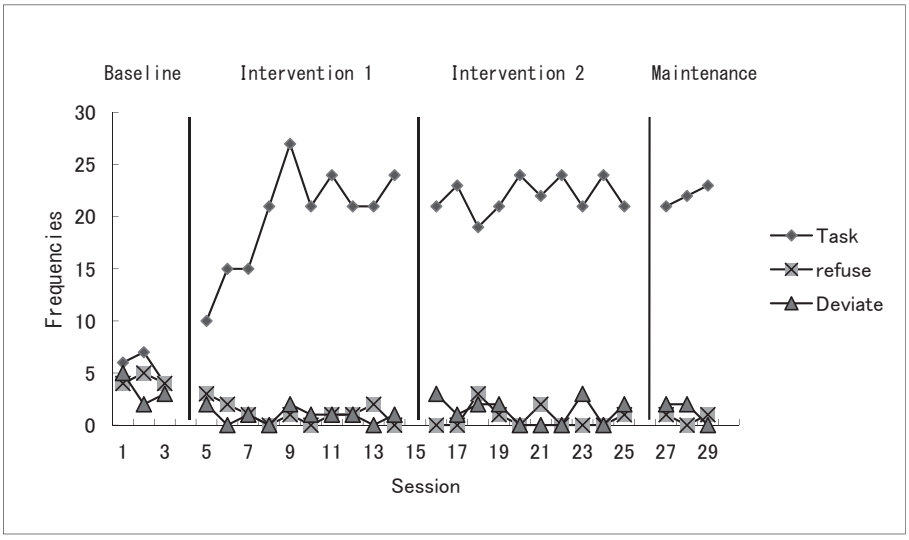

Fig. 2 Frequencies of one-day tasks, refusal and deviate behaviors during baseline to maintenance of intervention

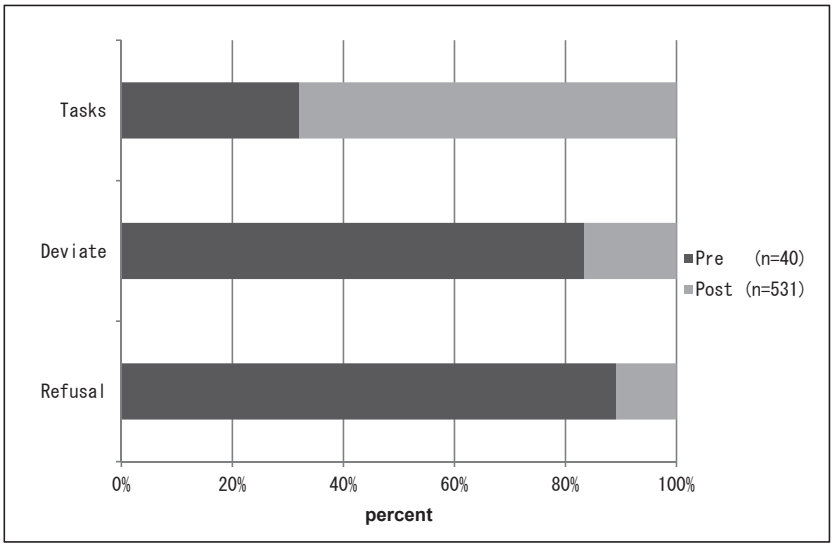

Fig. 3 Percentage of one-day tasks, refusal and deviate behaviors during pre-post intervention

Discussion

The results indicate that the inclusive structuring education designed for subject A's disability characteristics was effective with changing environments and behaviors, increasing the number of works and decreasing non-adaptive behaviors such as refusal and deviance. In intervention phase I, structured and organized environmental setting / independent task organization and PBS-oriented positive reinforcing mechanism adjustment seem to have reinforced *weak central coherence* in subject A's cognitive aspect and reduced behaviors including leaving his seat and refusal during working hands.

In light of subject A's "refusal" of work, no sense of accomplishment of "work itself" without task organization is deemed to have led to "conditioned aversive stimulus" which became a stressor, inducing "avoidance" from work. In contrast, the organization and reinforcement mechanisms, using the environmental and behavioral approach with structuring, are considered to have made "work" operant behavior as positive reinforcement. It is considered that concretization of the concepts of "beginning", "end" and "which work and how much work" visually understandable for the subject through work system development enhanced "shaping" of a series of actions for works. In this specific case, it is indicated that action representation with cards acted as an "active reinforcer".

We assert that comprehensive teaching of subject A corrected his cognitive dysfunctions which included *weak central coherence* and *executive dysfunction*. Central coherence is an ability to integrate individual information and construct a situational and higher-level meaning or an ability to sort information input from sensory organs to grasp the big picture [6]. This dysfunction generates a unique way of directing attention, which leads not only to making it more difficult to organize objects or experiences but also to a restriction to his/her own viewpoint and familiar procedures or patterns, resulting in impairments in social interaction and communication, etc. Therefore, generalization of skills and knowledge becomes difficult. Based on these factors, it is assumed that characteristic autistic (ASD)'s dysfunction is a gestalt disorder. The executive function is an ability to maintain appropriate problem-solving approaches to achieve a future goal, which is a cognitive faculty to make plans, judge priorities, methodize, select actions to be taken currently, and execute them [8]. Ozonoff et al (1991) defined this dysfunction as the basis of ASD. [10]. This dysfunction indicates a relationship with *weak central coherence* [17].

It can be considered that the comprehensively *structured teaching method* in this case started with

evaluating subject A's ability, packaged with a reasonably *structured teaching method* so as to fit his ability to vocational assistance, and reconstruct it as an adequate vocational skill. In particular, it is inferred that subject A's *weak central coherence* and *executive dysfunction* were corrected by appropriately drawing his attention through assignment of structured work in a structured time frame as well as by providing him with organized information, such as when, where, what and in what order, and how to deal with the work and what would happen next.

Conclusion

The results of this case study indicate that not only subject A's appropriate actions were effectively increased but also incentive to his daily routine and prospective plan were provided to him. Therefore, using structured ideas as an environmental approach and establishing a PBS reinforcement system seemed to help make subject A's activities in his vocational field more understandable and meaningful.

However, various problems still remain. The observation approach to subject A's communication skills is missing, and social reinforcement development from primary to high order conditioning cannot be completely assumed. Also, perspective on how to link with transitional assistance performed outside the facility needs to be discussed in the future.

Lastly, reports on the *structured teaching method* are still scarce. We wish that this case study contributes to the systematic reproducibility of assistance for ASD as therapy and treatment contribute to the individual.

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